Page 862, line 17; for **A.** MÍNIMA (L.) Dumort. read **A.** MÍNIMA (L.) Link.

[*Arnoseris minima* (L.) Link,· Enum. ii. 294. (1822); Dumort. Fl. Belg. 63 (1827). *Hyoseris minima* L. Sp. Pl. ii. 809 (1753).]

Page 863, line 13; *for* L. *read* [Vaill.] L.

Page 867, line 3; *for* e. Mass. to Ind. *read* N. E. to Neb. (*Bates*).

Page 871, line 48; *for* N. S. *read* e. Me.

Page 872, line 36; *after* Ont. *insert*: , Wisc.,

Page 873, line 55; *for* Mass. *read* w. Me. (*Miss Furbish*)

Page 888, column 2; beneath *hirsuticaulis* 812 insert: *ianthinus* 805

" multiflorus 811 insert: *multiformis* 805

" nemoralis 816 insert: *nobilis* 805

column 3; *beneath* tennesseensis 515 insert: *violaris* 805

Page 924, column 1, line 38; *for* Oxycoccus *read* Oxycoccos

GRAY HERBARIUM.

ON THE NATURE OF SO CALLED ALGAL OR BOGHEAD COALS.

EDWARD C. JEFFREY.

As the result of the studies of the French and Belgian paleobotanists Renault and Bertrand, on the dull bituminous coals and schists, certain organisms have been described, which have been considered by these authors to be the remains of oil-containing colonial gelatinous green Algae. It is assumed that the supposed Algae owe their preservation, in spite of their delicate organization, to the presence of bitumen throughout the matrix in which they have become fossilized. The origin of this bituminous matter has always been a puzzling problem. It has been variously suggested that it is derived from the putrefaction of animals, through the decay of part of the algal matter, or even as a product of the precipitation of the dark brown humus-saturated bog water, in which the Algae are supposed to have existed.

The study of coal presents a scientific problem of peculiar technical difficulty. On account of its black opacity, its structure can only be

made out in very thin sections, which allow a certain amount of light to be transmitted to the microscope. The preparation of such sections of sufficient thinness is an almost impossible task in many instances, on account of the brittleness of the coal, which greatly enhances the difficulty of the grinding processes, employed in the study of the microscopic structure of minerals. The writer in his studies on Mesozoic plants has acquired some experience in softening fossilized vegetable tissues, without essentially modifying their structure. An application of these methods to coal was without result, on account of the greater resistance of the material. It was found that neither *aqua regia* nor chlorate of potash yielded appreciable results in the desired direction. An *aqua regia* in which hydrochloric acid was replaced by hydrofluoric acid was finally tried with complete success. Even anthracite yields to its action in the course of a comparatively short time. Subsequently to exposure to nitrohydrofluoric acid for a sufficient interval, the coals, after careful washing, are soaked in hot alcohol containing from three to five *per cent.* of fixed alkali. The latter process effects the swelling of the constituents of the coal without disastrous cracking and softens them so that they may be sectioned by the delicate methods in vogue in biological laboratories. As a preliminary to cutting, the fragments of coal are infiltrated with nitro-cellulose to bring them to a more favorable consistency. The advantage of this method is, not only that it is possible to cut very much thinner sections than can be obtained by the grinding lathe of the mineralogist (3–5 *micra*), but that these sections may subsequently be bleached with nitric acid and strong chlorine water to almost any desired degree of decoloration.

The present notice is mainly to indicate the botanical composition of certain true bituminous coals, known as Bogheads, as examined by the methods indicated above. It has been demonstrated, that the supposed Algae of Renault and Bertrand, are in reality the larger spores or macrospores of Vascular Cryptogams, which flourished during the Coal Periods. The imagined Algae are in fact only the pores in the strongly sculptured coats of the spores in question. The apparent organization of the Algae as colonies forming a hollow sphere, is explained as the highly sculptured wall of the macrospore surrounding its empty cavity. The macrosporic nature of these remains is apparently placed beyond any doubt by the occurrence of the typical triradiate ridge on the face originally in contact with the three sister macrospores of the macrospore tetrad and by the very characteristic

macrosporic sculpture of the spore wall as seen in the thin sections prepared by the methods described above. Moreover their algal nature appears quite excluded by the fact that highly modified remains of wood have been found intermingled with the supposed Algae. It is not conceivable that delicate algal structures should have been preserved by the hypothetical bituminous matrix, while the much more resistant fragments of wood, should have suffered carbonification. The supposed Algae so far studied in this connection belong to the genera Thylax, Pila and Reinschia.

It seems highly probable as the result of these observations, that the bituminous matter found in Boghead and similar coals, as well as in oil-shales, etc., is rather a product of the modification of the natural waxy or cutinoid infiltration of the outer coats of innumerable spores (microspores as well as macrospores), than the product of animal or algal decay. The results here indicated seem further to overthrow the sapropelic or gelosic hypothesis of the formation of certain coals, and of petroleum proposed in Europe and to a certain extent adopted in this country.

Phanerogamic Laboratories of Harvard University,
9th March, 1909.

OCCURRENCE OF THE SKUNK CABBAGE IN AN UNUSUAL PLACE.

William Brewster.

The Skunk Cabbage is rarely met with, I believe, in other than low-lying and more or less swampy localities. At Concord, Massachusetts, however, there is a solitary plant of this species which has not only existed, but positively flourished, for a number of years, in a somewhat elevated and exceptionally dry situation on Ball's Hill. This long, narrow, gently curving ridge is of glacial origin and composed almost wholly of fine yellowish sand and coarse reddish gravel. It is everywhere densely wooded, chiefly with second-growth oaks intermingled with white and pitch pines. Beneath these trees the surface soil, although somewhat enriched with leaf mould, is so gen-